Possible Project Selection Conditions

- Adherence with the CALFED Solution Principles
- Conformance to Water Quality Common Program
- Environmental Analysis
- Technical Feasibility
- Cost/Benefit Analysis
- Legal Feasibility
- Financial and Institutional Feasibility

CALFED
BAY-DELTA
PROGRAM

D—033534

CALFED Bay-Delta Water Quality Parameters of Concern

Ecosystem Water Quality

Metals

- Cadmium
- Copper
- Mercury
- Selenium
- Zinc

Organics/Pesticides

- Carbofuran
- Chlordane
- Chlorpyrifos
- DDT
- Diazinon
- PCBs
- Toxaphene

Other

- Ammonia
- Dissolved Oxygen
- **Salinity (TDS, EC)**
- **Temperature**
- **Turbidity**
- Unknown Toxicity

D-033535

CALFED Ecosystem Water Quality
Water Quality Objectives
Metals

	4-Day Average Objectives		*Location-Specific Objectives*		*Incipient Lethal Levels to Salmonids* *0.5 x LC_{50} values*
Parameter	**USEPA**	**SF Bay Region Basin Plan**	**Central Valley Region Basin Plan**		**Department of Fish and Game**
Cadmium	**2.2 µg/l**	**0.32 µg/l** *(20 mg/l hardness)* (total)	River and tributaries from above State Hwy 32 bridge at Hamilton City	**0.10 µg/l** *(20 mg/l hardness)*	**0.60 µg/l** *(20 mg/l hardness)*
Copper	**9.0 µg/l**	**2.99 µg/l** *(20 mg/l hardness)* (total)	River and tributaries from above State Hwy 32 bridge at Hamilton City	**3.0 µg/l** *(20 mg/l hardness)*	**16.0 µg/l** *(20 mg/l hardness)*
Mercury	**0.012 µg/l** (total)	**0.025 µg/l**	--	--	--
Selenium	**5.0 µg/l** (total)	Look to their recommendations	Water supplies used for waterfowl habitat in the Grassland Water District, San Luis National Wildlife Refuge, and Los Banos State Wildlife Area	**2.0 µg/l** *(monthly mean)* (total)	not protective for bioaccumulation
Zinc	**120 µg/l**	**5.91 µg/l** *(20 mg/l hardness)* (total)	River and tributaries from above State Hwy 32 bridge at Hamilton City	**9.0 µg/l** *(20 mg/l hardness)*	**42.0 µg/l** *(20 mg/l hardness)*

SURGA bioaccumulation in lakes

JOE SCARUBA - FWS

D—033536

CALFED Ecosystem Water Quality

Water Quality Objectives
Organics/Pesticides

Parameter	4-Day Average Objective	24-hour Average Objective
Carbofuran	--	--
Chlordane	--	0.0043 µg/l
Chlorpyrifos	0.041 µg/l	--
Diazinon	--	--
DDT	--	0.0010 µg/l
PCBs	--	0.014 µg/l
Toxaphene	0.0002 µg/l	--

Source: USEPA National Ambient Water Quality Criteria, Freshwater Aquatic Life Protection

Basis — OFG Hazard Assessment Numbers. Jim Harrington

CALFED Ecosystem Water Quality
Water Quality Objectives
Additional Parameters

Parameter	Sacramento River	San Joaquin River	Delta	Suisun Bay
Ammonia				
Dissolved Oxygen				
Salinity				
Temperature				
Turbidity				
Unknown Toxicity				

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CALFED Bay-Delta Water Quality Actions

Non-Point Source Pollution Control: Boat Discharges

Action 29. Enforce regulation of boat discharges within the Delta and in water bodies tributary to the Delta.

CALFED Bay-Delta Water Quality Actions

Non-Point Source Pollution Control: Mine Drainage

Implement moderate on-site mine drainage remediation measures developed in site-specific studies at the Walker Mine, Malakoff Diggins, Leviathon Mine, Iron Mountain Mine, and Penn Mine sites. Control runoff from these mines and other high-priority sites based on current water quality objectives for pollutants. *(Cadmium, Copper, Mercury, ~~Selenium~~, Zinc, Salinity, Turbidity, Unknown Toxicity)*

Action 27. Fund through pollution -credit trading (reduce loading from mines in-lieu of costly wastewater treatment plant upgrades).

Action 28. Fund by other means.

Cyanide ?

CALFED Bay-Delta Water Quality Actions

What does this mean?

Watershed Management

Incentives and/or coordination with ongoing watershed management programs that promote and protect Delta water quality and fisheries. Includes watershed management within the area contributing to problems or able to mitigate problems within the Delta (including areas outside of the legal Delta).

Action 26. Focus on non-point source components of watershed management. *(DO, Salinity, Turbidity)*

Action 34. Focus on point source components of watershed management. *(Unknown Toxicity)*

Action 36. Focus on habitat restoration components of watershed management. *(Ammonia, Temperature, Turbidity)*

salinity in tidal marsh area

D-033541

CALFED Bay-Delta Water Quality Actions

Non-Point Source Pollution Control: Urban and Industrial Runoff

Control the sources of urban and industrial runoff (reduce the amount of applied water, or reduce the loading of agrochemicals and other pollutants).

Action 23. Enforce existing source control regulations. *(Cadmium, Copper, Mercury, Selenium, Zinc, Ammonia, DO, Turbidity)*

Action 24. Provide incentives for additional source control. *(Chlorpyrifos, Diazinon, Unknown Toxicity)*

Action 25. Better planning of new development. *(Chlorpyrifos, Diazinon, Unknown Toxicity)*

CALFED Bay-Delta Water Quality Actions

Non-Point Source Pollution Control: Urban and Industrial Runoff

Reduce flows and/or concentrations. Highest priority are areas contributing largest amounts of pollutants of concern.

Action 22. Detain an additional ~~20 - 30%~~ of runoff water, time release strategically. *(Cadmium, Copper, ~~Mercury~~, ~~Selenium~~, Zinc, Chlorpyrifos, Diazinon, Ammonia, DO, Unknown Toxicity)*

↑

Caused at dry weather flow?

CALFED Bay-Delta Water Quality Actions

Flow Management: Dilution

Acquire water by constructing new storage.

Action 9. Upstream of the Delta. *(Selenium, Carbofuran, Chlorpyrifos, Diazinon, Ammonia, DO, Salinity, Temperature)*

Action 10. Downstream of the Delta (in the Delta-Mendota Canal, the California Aqueduct, etc. *(Chlorpyrifos)*

Action 11. In the Delta. *(Chlorpyrifos)*

CALFED Bay-Delta Water Quality Actions

Flow Management: Delta Facilities

Action 12. Develop Improvements at the head of Old River to block fish movement into Old River, and to manage water flow and stage down Old River. *(Selenium, Carbofuran, ~~Chlordane~~, Chlorpyrifos, ~~DDT~~, ~~PCBs~~, ~~Toxaphene~~, DO, Salinity, Turbidity, Unknown Toxicity)*

Action 13. Implement Delta Long-term Protection Plan (includes levee O&M). *(Cadmium, Copper, Selenium, Zinc, Chlordane, DDT, PCBs, Toxaphene, Salinity, Turbidity, Unknown Toxicity)* MERCURY

D-033545

CALFED Bay-Delta Water Quality Actions

Non-Point Source Pollution Control: Agricultural Drainage

Reduce salt and other agricultural drainage constituent loading to Delta by reducing drainage flows and/or concentrations. Highest priority are lands with costly and severe drainage problems. *(Cadmium, Copper, Mercury, Selenium, Salinity) (Chlordane, Chlorpyrifos, DDT, PCBs, Toxaphene, Salinity, Unknown Toxicity)*

+ Q — DIAZINON +/−

Action 1. Alter timing of inflow by detaining agricultural drainage in the San Joaquin Valley.

Action 14. Detain drainage water (restrict drainage discharges during periods of low Delta inflow) and control the timing of release.

CALFED Bay-Delta Water Quality Actions

Non-Point Source Pollution Control: Agricultural Drainage

Control the sources of agricultural drainage (reduce the amount, or improve the quality of applied water, or reduce loading of trace elements and agrochemicals).

Action 15. Restrict spraying adjacent waterways. *(~~Selenium~~, Carbofuran, Chlorpyrifos, Diazinon, ~~Salinity~~, Unknown Toxicity)*

Action 16. Provide incentives for additional source control, including higher water use efficiency and reduced agrochemical loading. *(~~Cadmium~~, Copper, Selenium, Chordane, Chlorpyrifos, DDT, PCBs, Toxaphene, Ammonia, Salinity, Turbidity, ~~Unknown Toxicity~~)*

Action 17. Provide a high-quality irrigation water supply. + veg ?

Action 18. Land retirement and temporary fallowing (especially during drought) through incentive programs. *(Selenium, Chlordane, Chlorpyrifos, DDT, PCBs, Toxaphene, Ammonia, Salinity, Turbidity, Unknown Toxicity, ,)* →

Action 19. Concentration and disposal of drainage water. *(Chlorpyrifos, Chlordane, DDT, PCBs, Toxaphene, Turbidity)*

Diazinon, Unknown Toxicity, Salinity

D-033547

CALFED Bay-Delta Water Quality Actions

Flow Management: Dilution

Use ~~50,000 to 100,000 acre-feet of~~ existing water supply (any surface water currently captured or groundwater currently pumped in the Central Valley). San Joaquin ?

Action 2. Acquire water from willing sellers. *(~~Selenium~~, ~~Chlorpyrifos~~, DO, Salinity)*

Action 3. Acquire water by providing incentives for more efficient water management, including reservoir re-operation. *~~(Chlordane, Chlorpyrifos, DDT~~, ~~Toxaphene~~, Turbidity)*

of dams

~~**Action 4.** Acquire water through temporary land fallowing.~~

✓ will leave water in stream

Action 5. Acquire water through urban water conservation. *(Chlorpyrifos, Ammonia)* – Assumes inside & outside conservation? Diazinon.

Action 6. Acquire water through wastewater reclamation. *(Metals?, Chlorpyrifos, Turbidity)*

Don't understand how it would help.

Lower Feather R.

CALFED Bay-Delta Water Quality Actions

Flow Management: Dilution

Use new water supply (groundwater not currently pumped or new storage).

Action 7. Acquire water by treating agricultural drainage.
(~~Cadmium~~, Copper, Selenium, Chlorpyrifos, Ammonia, Salinity)

Action 8. Acquire water by developing additional groundwater supply.
~~(Chlorpyrifos~~)

CALFED Bay-Delta Water Quality Actions

Non-Point Source Pollution Control: Agricultural Drainage

Treatment of agricultural drainage.

Action 20. Treat in wetlands. *(Metals?, Chlordane, Chlorpyrifos, DDT, PCBs; Toxaphene, Ammonia, DO, Salinity, Turbidity, Unknown Toxicity)*

Action 21. Treat 20 - 30% by other means (e.g., reverse osmosis) and recycle or use for flow augmentation. *(Cadmium, Copper, Mercury, Selenium, Chlordane, Chlorpyrifos, DDT, PCBs, Toxaphene, Ammonia, DO, Salinity, Temperature, Turbidity, Unknown Toxicity)*

CALFED Bay-Delta Water Quality Actions

Point Source Pollution Control: Industrial and Municipal Wastewater Treatment

Action 30. Treat municipal wastewater in wetlands. *(Chlorpyrifos, Diazinon, Unknown Toxicity)*

Action 31. Encourage pollution credit trading to reduce pollution in a cost-effective manner.

Action 32. Incentives for phased conversion of municipal wastewater treatment facilities from processes producing large concentrations of disinfection by product precursors (DBPs).

Action 33. Incentives for reclamation and reuse of industrial and municipal wastewater. *(Chlorpyrifos, Unknown Toxicity)*

CALFED Bay-Delta Water Quality Actions

Water Supply Treatment

Action 35. Provide incentives to upgrade drinking water treatment through filtration. *(Unknown Toxicity)*

CALFED Bay-Delta Water Quality Parameters of Concern

Agriculture Water Quality

- Boron
- Chloride
- **Nutrients**
- pH
- **Salinity**
- SAR
- **Turbidity**
- **Temperature**

CALFED Bay-Delta Water Quality Parameters of Concern

Urban Water Quality

- Bromide
- **Nutrients**
- Pathogens
- **Salinity**
- TOC
- **Turbidity**
- Viruses
- Other

CALFED Ecosystem Water Quality
Water Quality Objectives[1]
Additional Parameters

Parameter	Sacramento River	San Joaquin River	Delta	Suisun Bay
Ammonia	0.08 - 2.5 µg/l	0.08 - 2.5 µg/l		
Dissolved Oxygen	7000 µg/l	5000 µg/l	5000 µg/l	
Salinity (EC)	1.5 - 3.4 mmhos/cm	1.5 - 3.7 mmhos/cm		
Temperature	< 68° F	< 68° F		
Turbidity				
Unknown Toxicity				

[1] Values used need to take into account biological site-specific requirements

CALFED Ecosystem Water Quality
Water Quality Objectives
Metals

	4-Day Average Objectives		*Location-Specific Objectives*		*Incipient Lethal Levels to Salmonids* $0.5 \times LC_{50}$ *values*	*Maximum Contaminant Levels*		*SNARLs*	
Parameter	USEPA	SF Bay Region Basin Plan	Central Valley Region Basin Plan		Department of Fish and Game	DHS	EPA	EPA	NAS
Cadmium	**2.2 µg/l**	**0.32 µg/l** *(20 mg/l hardness)* (total)	River and tributaries from above State Hwy 32 bridge at Hamilton City	**0.10 µg/l** *(20 mg/l hardness)*	**0.60 µg/l** *(20 mg/l hardness)*	5 µg/l (primary/goal)	5 µg/l (primary)	5 µg/l	5 µg/l
Copper	**9.0 µg/l**	**2.99 µg/l** *(20 mg/l hardness)* (total)	River and tributaries from above State Hwy 32 bridge at Hamilton City	**3.0 µg/l** *(20 mg/l hardness)*	**16.0 µg/l** *(20 mg/l hardness)*	1000 µg/l (secondary)	1300 µg/l (primary/ goal); 1000 µg/l (secondary)	--	--
Mercury	**0.012 µg/l** (total)	**0.025 µg/l**	--	--	--	2 µg/l (primary)	2 µg/l (primary/goal)	2 µg/l	--
Selenium	**5.0 µg/l** (total)	--	Water supplies used for waterfowl habitat in the Grassland Water District, San Luis National Wildlife Refuge, and Los Banos State Wildlife Area	**2.0 µg/l** *(monthly mean)* (total) [a]	--	50 µg/l (primary)	50 µg/l (primary/goal)	--	--
Zinc	**120 µg/l**	**5.91 µg/l** *(20 mg/l hardness)* (total)	River and tributaries from above State Hwy 32 bridge at Hamilton City	**9.0 µg/l** *(20 mg/l hardness)*	**42.0 µg/l** *(20 mg/l hardness)*	5000 µg/l (secondary)	5000 µg/l (secondary)	2000 µg/l	--

Red text indicates water quality goals established by the ecosystem water quality committee

[a] This goal may not be protective given the bioaccumulative nature of selenium

CALFED Ecosystem Water Quality
Water Quality Objectives
Organics/Pesticides

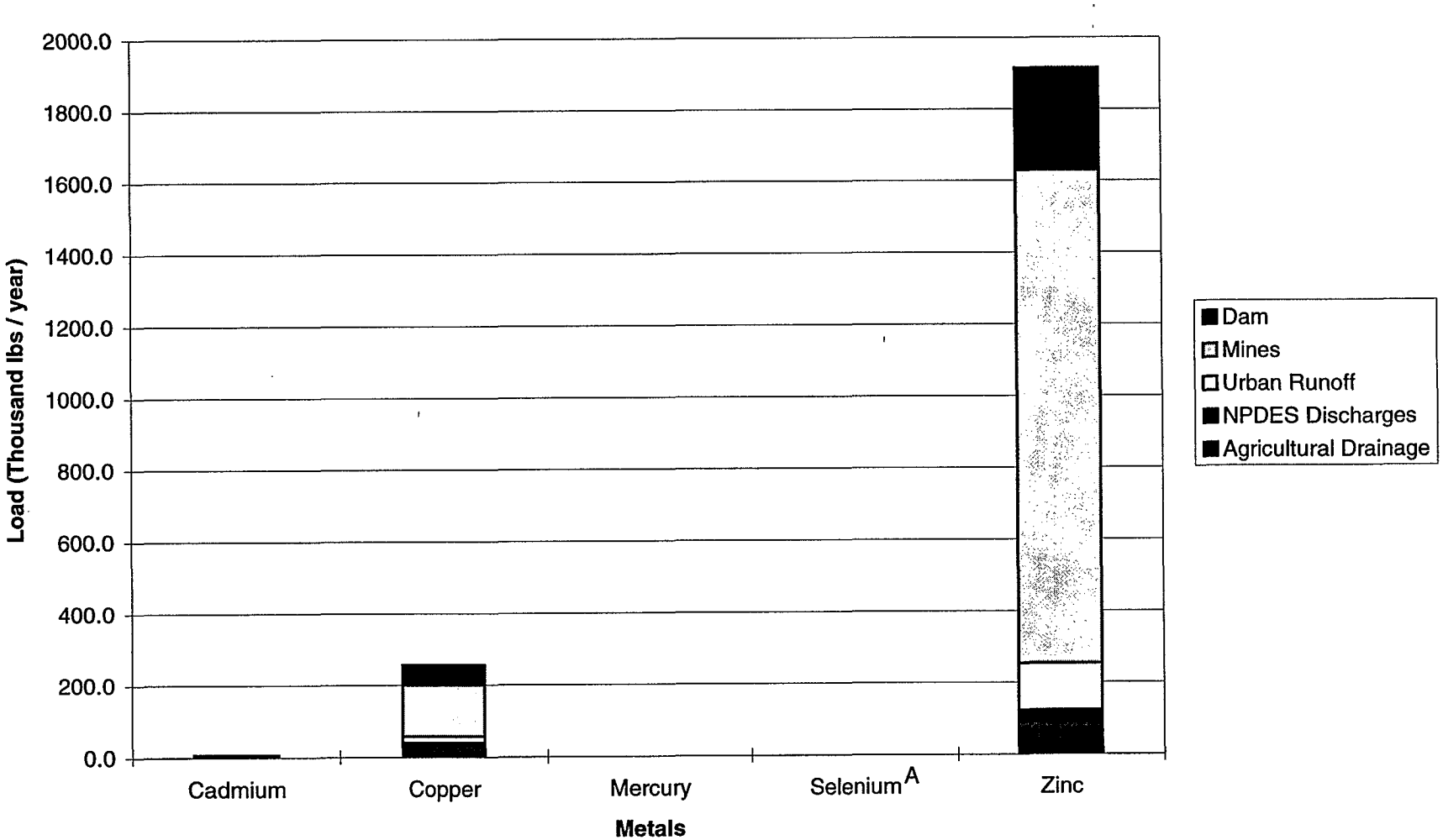
	USEPA National Ambient Water Quality Criteria Freshwater Aquatic Life Protection		Maximum Contaminant Levels		SNARLs		Health Advisories or SNARLs	Drinking Water and Health Guidelines
Parameter	**4-Day Average Objective**	**24-hour Average Objective**	**DHS**	**EPA**	**EPA**	**NAS**	**USEPA**	**NAS**
Carbofuran	--	--	18 µg/l (primary)	40 µg/l (primary/goal)	40 µg/l	--	--	--
Chlordane	--	0.0043 mg/l	0.1 µg/l (primary)	2 µg/l (primary); 0 µg/l (goal)	60 µg/l (10-day)	--	0.03 µg/l	0.028 µg/l
Chlorpyrifos	0.041 mg/l	--	--	--	20 µg/l	--	--	--
Diazinon	--	--	14 µg/l (action level)	--	0.6 µg/l	14 µg/l	--	--
DDT	--	0.0010 mg/l	--	--	--	--	--	0.042 µg/l
PCBs	--	0.014 mg/l	0.5 µg/l (primary)	0.5 µg/l (primary); 0 µg/l (goal)	--	50 µg/l (7-day)	0.005 µg/l	0.16 µg/l
Toxaphene	0.0002 mg/l	--	--	--	--	--	--	--

Source: USEPA National Ambient Water Quality Criteria, Freshwater Aquatic Life Protection

CALFED Bay-Delta Water Quality
Ecosystem Water Quality

Dacthal	Chromium
Diuron	Dioxin
MBTE	Methyl Parathion

Mass Loading of Metals of Concern in the Sacramento Valley



A: Loads for Selenium were presented as ug/l in the tissues of certain aquadic life. No values could be located indicating dissolved concentrations in a given water body.

Information from "A Mass Loading Assessment of Major Point and Non-point Sources Discharging to Surface Waters in the Central Walley, California, 1985" by the California Regional Water Quality Control Board. (Table VIII - 4, pg 55)

CALFED Bay-Delta Water Quality Parameters of Concern

Ecosystem Water Quality

Metals

- Cadmium
- Copper
- Mercury
- Selenium
- Zinc

Organics/Pesticides

- Carbofuran
- Chlordane
- Chlorpyrifos
- DDT
- Diazinon
- PCBs
- Toxaphene

Other

- Ammonia
- Dissolved Oxygen
- **Salinity (TDS, EC)**
- **Temperature**
- **Turbidity**
- Unknown Toxicity

Organochlorine Compound

PCBs

Source: Banned from use in 1977 - remain persistent in environment (approximately 1/4 of production still in service - transformers and capacitors)

- Primary - Sediment
- Secondary - Airborne deposition

Bioaccumulate and biomagnify throughout food chain

Chronic effects to liver and reproductive systems of mammals

PESTICIDES

DDT, Toxaphene and Chlordane

Bioaccumulative
Periodically detected in fish tissue throughout basin - may cause mortality to fish eggs and fry, impair reproduction

Carbofuran, Chlorpyrifos, Diazinon

Degrade rapidly but by-products may be toxic

Levels of diazinon frequently exceed criteria set to protect aquatic life

Chlorpyrifos concentrations in San Joaquin Basin frequently exceed LC50 levels for Ceriodaphnia

Diazinon and chlorpyrifos concentrations result in reduction in abundance of sensitive invertebrates (fish food)

Carbofuran concentrations exceed concentrations that are known to cause problems to Ceriodaphnia (in Delta back sloughs)

D-033562

Metals

Cadmium, Copper and Zinc

Acute toxicity: high levels > fish kills over short periods

Chronic toxicity: low levels >Growth and physiological problems

Water quality objectives frequently exceeded during wet season downstream of Keswick Dam

Mercury and Selenium

Can biomagnify throughout food chain

Mercury

Problem from Colusa through Delta
Exceed EPA criteria 20-30% of time during high flows

Selenium

High levels detected in tissues of fish collected on San Joaquin River
Reproductive effects on wildlife

Metals

Cadmium, Copper, Zinc, Mercury

Source: Sacramento River

- Primary -Inactive and abandoned mine discharges
- Secondary - Urban runoff
  Cu - Brake pads, root control
  Hg - Atmospheric deposition

  NPDES discharges

  Agricultural drainage

Selenium

Sources: San Joaquin River System, In-Delta

- Primary - Agricultural drainage

  Refineries

Parameter of Concern

A parameter is of concern to ecosystem water quality providing that:

- Reliable data on the parameter shows:

  concentrations exceed established criteria for the applicable medium (e.g. water, sediment, or tissue) and;

  the exceedances are of a frequency, duration or magnitude that, in the best judgment of the ecosystem water quality sub-team, may likely result in adverse impacts to biota inhabiting or using the Delta aquatic ecosystem.

- Chronic or acute toxicity in bioassays is attributable to a parameter based on a toxic identification evaluation (TIE).

- Research/special studies provide evidence of behavioral, physiological, or reproductive impacts associated with a "parameter".

- A problem is generally recognized by the resource and regulatory agencies.

Other Parameters

Ammonia

Dissolved Oxygen

Salinity

Temperature

Turbidity

Unknown Toxicity